

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY



To:

see form PCT/ISA/220

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/GB2004/004920

International filing date (day/month/year)  
22.11.2004

Priority date (day/month/year)  
21.11.2003

International Patent Classification (IPC) or both national classification and IPC  
D01F9/127, C01B31/02, C01B3/26, B01J8/02, B01J8/12, B01J8/28, B01J8/00, B01J19/02

Applicant  
STATOIL ASA

### 1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

### 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

### 3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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**WRITTEN OPINION OF THE  
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**Box No. I Basis of the opinion**

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1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material:
    - ☐ in written format
    - ☐ in computer readable form
  - c. time of filing/furnishing:
    - ☐ contained in the international application as filed.
    - ☐ filed together with the international application in computer readable form.
    - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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**Box No. II Priority**

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1. ☐ The following document has not been furnished:

- ☐ copy of the earlier application whose priority has been claimed (Rule 43bis.1 and 66.7(a)).
- ☐ translation of the earlier application whose priority has been claimed (Rule 43bis.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43bis.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.
3. ☒ The International Searching Authority has not been able to consider the validity of the priority claim because a copy of the earlier application whose priority has been claimed was not available to the International Searching Authority at the time that the search was conducted (Rule 17.1). This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.
4. Additional observations, if necessary:

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**Box No. IV Lack of unity of invention**

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1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has:
- ☐ paid additional fees.
  - ☐ paid additional fees under protest.
  - ☒ not paid additional fees.
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- ☐ complied with
  - ☒ not complied with for the following reasons:  
**see separate sheet**
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☐ all parts.
  - ☒ the parts relating to claims Nos. 1-30

**WRITTEN OPINION OF THE  
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**Box No. V Reasoned statement under Rule 43*bis*.1(a)(I) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	2,4,8-9,16,18,22-24,26,27,29,30
	No: Claims	1,3,5-7,10-15,17,19-21,25,28
Inventive step (IS)	Yes: Claims	
	No: Claims	1-30
Industrial applicability (IA)	Yes: Claims	1-30
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

**Re Item IV.**

The separate inventions/groups of inventions are:

- 1) Claims 1-30: Method and reactors capable of producing particulate carbon material using a fluidized catalyst.
- 2) Claims 31-36: Reactor with a plurality of reaction surfaces.
- 3) Claims 37-43: Reactor with a plurality of gas inlet ports disposed so as to introduce inlet gas directly into the reaction bed.

They are not so linked as to form a single general inventive concept (Rule 13.1 PCT) for the following reasons:

The only existing feature linking together the three groups of inventions is a reactor having gas inlet and gas outlet ports. This does not constitute a special technical feature as defined in Rule 13.2 PCT.

**Re Item V.**

- 1 The following documents are referred to in this communication:
  - D1 : WO 03/066521 A (CARBON NANOTECH RESEARCH INSTITUTE INC; NISHIMURA, KUNIO; MAENO, HIROM) 14 August 2003 (2003-08-14)
  - D2 : DE 199 54 225 A1 (KANZOW, HENNING) 23 May 2001 (2001-05-23)
  - D3 : EP 1 277 858 A (NIKKISO COMPANY LIMITED) 22 January 2003 (2003-01-22)
  - D4 : WO 02/092506 A (CAMBRIDGE UNIVERSITY TECHNICAL SERVICES LIMITED; SHAFFER, MILO) 21 November 2002 (2002-11-21)
  - D5 : M.S. DRESSSELHAUS ET AL: "GRAPHITE FIBERS AND FILAMENTS" 1988, SPRINGER-VERLAG , BERLIN-HEIDELBERG , XP002319310

**2 Novelty (Art. 33(2) PCT):**

- 2.1** Document D1 discloses a method for producing fine carbon material (see WPI abstract) by decomposition of hydrocarbon gases on transition metal catalysts particles flowing in the reaction gas. A reactor (figure 1) for manufacturing the fine carbon material is also disclosed having in its upper part a solid particle supply plus a gas outlet port and on its bottom a gas inlet port plus a catalyst/product outlet port. The reaction occurs on the catalyst particles suspended in the middle part of the reactor and the particulate carbon produced is then discharged from the reactor by falling out of it. The hydrocarbon gas is recycled during the process.

In the light of this document the subject-matter of independent **claims 1, 19, 20 and 21** is not novel.

- 2.2** Document D2 discloses a method for producing carbon nanofibers (column 3, lines 50-52) through a continuous, catalytic process. The process features the use of a catalyst precursor in an emulsion and a hydrocarbon material (column 3, line 53-column 4, line 51) which, when heated in determined conditions decomposes to carbon nanofibers whilst the catalyst particles are formed from the catalyst precursor material. The process is performed in a reactor comprising an upper part with the inlet ports for the reactive gas and the emulsion, a middle heated part where the catalyst particles and then the carbon nanofibers are formed and a lower part where the product falling from the middle part is recovered (figure 1).

In the light of this document the subject-matter of independent **claims 1, 19 and 20** is not novel.

- 2.3** Document D3 discloses a method and an apparatus for producing carbon fibrous material, like carbon nanofibers (example 1) by thermal decomposition of hydrocarbon material. The metal catalyst source and the gaseous carbon source are introduced into the reactor through a nozzle 10 on the top part of it (figure 1; [0033] and [0036]). The products formed in the reactor are then discharged from it through the discharge pipe 31 at its bottom.

In the light of this document the subject-matter of independent **claims 1, 19 and 20** is not novel.

- 2.4** Document D4 discloses a method for producing nanoscaled carbon materials comprising decomposing carbon containing gas on supported catalyst particles. The catalyst particles are formed in situ from suitable catalyst precursor material (page 3, line 18- page 4, line 21). In one embodiment of the invention (example 1) the carrier gas containing the precursor of the catalyst and the carbon containing gas is supplied from the bottom of the furnace in order to suspend the support particles in the reactor.

In the light of this document the subject-matter of independent **claims 1, 19 and 20** is not novel.

- 2.5** Document D5 discloses a method for producing carbon fibers (page 28, line 17- page 29, line 12; figure 2.15a). The catalyst particles, or their precursor, are introduced in a reactor together with carbon containing gas. Hydrogen gas, introduced from the bottom of the reactor, suspends the catalyst particles in the middle part of the reactor where the decomposition of the reacting gas occurs. The carbon material formed falls on the bottom of the reactor.

In the light of this document the subject-matter of independent **claims 1, 19 and 20** is not novel.

- 3** Dependent **claims 2-18, 25-30** do not contain any features which, in combination with the features of any claim to which they refer, ~~meet~~ meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2) and (3) PCT).